IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	:		
Chul-Hwan Kim et al.	:		
U.S. Serial No. 10/830,173	:	Examiner:	J. Goodrow
Filed April 22, 2004	:	Group Art Unit:	1756
Docket No. DPI-12 (HY-03-1)	:		
For: POWDER-COATED TONER PARTICLES	:		

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Declaration under 37 C.F.R. § 1.132

Sir:

Dr. Hyun-Nam Yoon, co-inventor of the subject matter of the above-noted patent application hereby declares that:

1. He is the same Hyun-Nam Yoon that is a co-inventor of the subject matter of United States Patent Application Serial No. 10/830,173, referenced above.

2. He was awarded a Doctorate of Philosophy Degree in Chemical Engineering from Rutgers University, New Brunswick, New Jersey in 1975 and has worked in the field

of applied polymer science for over twenty (20) years, including extensive experience in dyed polymer systems and polymer systems including chromophores.

3. He understands from counsel that the claims of the above-noted patent application have been rejected on the basis of obviousness over United States Patent No. 4,837,107 to *Axelsson et al.,* United States Patent No. 4,254,201 to *Sawai et al.*, and United States Patent No. 6,416,918 to *Matsumura et al.*, and that he is familiar with the cited references.

4. That the present invention relates to a toner composition which includes a toner core particle and plurality of discreet pigment particles which are directly affixed to the core particle. The pigment particles are much smaller than the core particles. According to one aspect of the invention, the toner composition is prepared by mixing the core resin with the colorant composition such that the colorant particles are directly affixed to the core particles with inter-particulate electrostatic forces, where the colorant is present at loadings sufficient for high-resolution applications.

5. That US Patent No. 4,837,107 to *Axelsson et al.*, cited by the Examiner, discloses a toner composition which includes a polymer core, and a polymeric shell which may contain colorants. That the *Axelsson et al.* reference notes that the that the pigment may be optionally distributed on the base particle by mechanical treatment, prior to adding the polymeric shell. See, e.g., col. 9 of *Axelsson*:

> The colorant can be added to the base particles before the polymer powder, solution or dispersion is added, e.g. by making a liquid colorant wet or penetrate the base particles, optionally in the presence of a solvent as a means for aiding diffusion. Alternatively, a solid colored substance such as a pigment can be distributed on the base particle surface e.g. by being treated mechanically together with the base particles. A solvent or dispersion agent can optionally be used also in this case to facilitate the adhesion of the pigment particles to the base particles and/or to soften the surface of the base particles to improve the retention of the particles. Meth-

6. That, a person of ordinary skill in the art may interpret the above passage to mean that some adhesion can be achieved between the colorant and the base particle by mechanical treating. Notwithstanding, the *Axelsson et al.* reference is not at all suggestive of the inventive subject matter as embodied in claim 21, for instance, which relates to a small particle toner composition having colorant present in high loadings, where the colorant is electrostatically bonded to the core resin. Indeed, the results observed by the inventive method are surprising in view of the *Axelsson et al.* patent. In this regard, a person of ordinary skill in the art would not expect that the colorant composition would adequately adhere to the resin core particles in amounts sufficient to provide suitable printing properties (3-30 %), by simply applying shear force. Elevated colorant loading is critical for high-resolution applications. Without intending to be bound by theory, it is believed that in the present invention, the colorant particles and the resin particles unexpectedly develop a strong attraction toward each other during blending (*e.g.*, via electrostatic forces), such that the colorant particles become securely affixed to the core particles. In fact, reading the *Axelsson et al.* reference as a whole, a skilled artisan would assume that additional measures are needed to provide sufficient colorant adhesion, for example, melt bonding or the presence of a shell resin.

7. That the results achieved by the invention can be seen, for instance, in Example 2 of the pending application where a toner composition is produced by mixing core particles with a yellow colorant composition at elevated shear. The quality of the toner is evaluated in the application at page 21 of the application as originally filed, reproduced below:

> meltable resin core surface. Electrostatic charging properties of the yellow toner composition were determined by a blow-off method using a Faraday cage (Vertex Charge Analyzer, Vertex Image Products, Yukon, Pa.). The charge of toner after 1 minute mixing with Type-22 carrier was −27 μC/g. Fusing property of the toner was determined using a custom-designed heated roll-type fusing tester. A small amount of toner was spread on a sheet of paper and was passed through a pair of heated roller at a linear speed of about 720 cm/min. When the roller temperature was below 140° C., cold offset phenomena was observed and, above 220° C., hot offset was observed, resulting in a very large fusing latitude of 80° C. for the toner composition. Further, the toner sample was introduced into a cartridge of HP-4500 printer and patterns were printed. Line acuity and solid patches with a uniform optical intensity 1.17 of were observed after printing 5,000 pages.

That it is surprising that the above printing properties, such as optical intensity, can be achieved by the simple techniques described in the pending application. Example 2 indicates, unexpectedly, that the electrostatic adhesion between the colorant particles and the core particles is sufficiently strong for toner applications, even where the toner composition is produced without a shell resin.

8. That *Axelsson et al.* generally suggests that substantial melt bonding is required for adequate adhesion, particularly if the shell resin is added as a powder. *See*, *Axelsson* , at col. 11:

> The polymer can also be added in dry powder form to the base particles. The addition of the polymer and a colorant is made under agitation and at a temperature which is sufficiently high for allowing adhesion of essentially the entire amount of added shell-polymer to the surface of the base particles and at a temperature which is sufficiently low for preventing any substantial mutual agglomeration between the base particles, both the uncovered and the covered.

9. That, the above passage in *Axelsson et al.* represents the conventional view that the colorant particles should be blended with the core components and shell resin under heat in order to provide sufficient adhesion. That accordingly, in his opinion, the *Axelsson et al.* reference is not remotely suggestive of the claimed invention, as amended. That the remaining art of record also does not teach the claimed subject matter. For example, *Matsumura et al.* makes reference at col. 1 , lines 26+ of the conventional melt-kneading of pigments into toner resins.

10. Moreover, the toner composition in *Axelsson et al.* teaches that the colorant composition is dispersed throughout the shell resin. That in contrast, the toner of the invention as embodied in independent claims 20, 21 and 28, has colorant that is present as a discrete particles on the surface of the base toner and adhered thereto, where the colorant layer generally does not include any resin component. Even in embodiments of the invention which contain a protective resin layer, the colorant composition resides at the interface of the core particle surface and are not evenly distributed throughout the outer resin layer.

11. That core-shell type structures, as embodied in *Axelsson et al.*, have been widely suggested but are virtually unavailable commercially. That this is believed due to the exceptionally complex process associated with making toners of this type. For example, core-shell toner of the type in *Axelsson* typically requires the separate steps of preparing a pigment dispersion in an aqueous medium, and drying the water off of the shell. This can be a slow and expensive technique. Furthermore, formation of the shell requires careful regulation of the temperature, to simultaneously evaporate water out of the shell, prevent coagulation of toner particles, and fuse the shell to the core particle.

12. That due to the surprisingly high colorant loading on small toner particles, the inventive method allows for superior quality toner in high resolution color printing, without encountering the problems that are associated with conventional process of making core/shell toners, *e.g.*, melt-blending which entails lengthy and expensive

mixing operations which are difficult to control. Furthermore, the method of the invention is simple, reproducible, and economical. In stark contrast to the methods described in the art of record, the process used in the present invention generally only requires the admixing of particles and agitating at a high speed in a dry state.

13. The undersigned Declarant declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the subject application or any patent issuing thereon.

August 17, 2006
Date

Hyun-Nam Yoon